REMARKS

The Office Action dated December 13, 2007 has been received and carefully studied.

The Examiner objects to the drawings because they contain the PCT applications numbers at the top of each drawing sheet, and because Figures 1, 6 and 7 because they contain multiple views that have not been separately labeled, and because Figure 1 contains black shading. Submitted herewith are corrected drawings which address the objections.

The Examiner objects to the application because it does not contain an Abstract of the Disclosure as a separate sheet. By the accompanying amendment, an Abstract as a separate sheet has been provided.

The Examiner requires correction of pages 1 and 6 of the specification because the claims are referred to by number. By the accompanying amendment, pages 1 and 6 have been amended accordingly.

The Examiner requires that the brief description of the drawings be labeled as such. By the accompanying amendment, the specification has been so amended.

The Examiner states that the brief descriptions for Figure 13-17 refer to different numbered embodiments of a flow meter and do not briefly describe the embodiment of the flow meter.

This objection is respectfully traversed. Applicants respectfully submit that the brief description is appropriate. As stated in 37 CFR 1.74,, when there are

drawings, there shall be a brief description of the several views of the drawings and the detailed description of the invention shall refer to the different views by specifying the numbers of the figures, and to the different parts by use of reference letters or numerals (preferably the latter). There is no specific protocol on the extent of the detail necessary in the brief description. Identifying the drawings by embodiment is certainly sufficient.

The Examiner requires correction of the phrases on page 8, line 33 and on page 12, last line. By the accompanying amendment, these phrases have been corrected.

The Examiner states that page 13 refers to Equation 1 but that this equation is not the first one appearing in the specification, and requires correction. This objection is respectfully traversed. The terminology "Equation 1" does not necessarily mean that this is the first equation in the specification. Equation 1 is so labeled in order to refer back to it accordingly, such as is done on page 21, line 9. Since Equation 1 is prominently labeled, it is clear what is being referred to when this terminology is used. To renumber every equation in the specification simply because an equation is mentioned on page 3 as background information would be unduly burdensome, confusing, and is not required by the rules of practice.

The Examiner rejects claims 1-21 under 35 U.S.C. §112, second paragraph, as being indefinite for various reasons. The Examiner states that step b of claim 1 recites that the degree of annular flow is determined based on the measurements of step a, but that the claim does not point out how the measurements of step a are used to determine the degree of annular flow. The Examiner adds that the same problem occurs in claims 5 and 6 and in claim 12. The Examiner also states that step c of claim 1 recites the permittivity of the flow mixture is calculated based on the results from steps a and b including correction for the degree of annular flow, which does not particularly point out how the results from steps a and b are being used to calculate the permittivity of the flow mixture and does not particular point out how the degree of annular flow is being corrected, and that the same problem occurs in claim 12.

The rejection is respectfully traversed.

It is well settled that it is the function of the *specification*, not the claims, to set forth operable parameters, and claims are not rendered indefinite by the absence of such limitations therein. See *Ex parte Jackson*, 217 U.S.P.Q. 804 (Bd. App. 1982); *In re Johnson and Farnham*, 194, U.S.P.Q. 187 (CCPA 1977); *In re Goffe,* 191 U.S.P.Q. 429

(CCPA 1976). As stated in *In re Goffe* by the Court in reversing the Board's rejection of claims under 35 U.S.C. §112:

> "[f]or all practical purposes, the board would limit appellant to claims involving the specific materials disclosed in the examples, so that a competitor seeking to avoid infringing the claims would merely have to follow the disclosure in the subsequently-issued patent to find a substitute. However, to provide effective incentives, claims must adequately protect inventors. To demand that the first to disclose shall limit his claims to what he has found will work or to materials which meet the guidelines specified for 'preferred' materials in a process such as the one herein involved would not serve the constitutional purpose of promoting progress in the useful arts."

Similarly, in *In re Johnson and Farnham*, the Court stated:

> "First, we note that it is the function of the specification, not the claims, to set forth the 'practical limits of operation' of an invention. . . . One does not look to claims to find out how to practice the invention they define, but to the specification. . . . Second, we note that the specification *as a whole* must be considered in determining whether the scope of enablement provided by the specification is commensurate with the scope of the claims. . . . The PTO would limit appellants to claims reciting a sigma* value of at least 0.7. This view is improper because it requires the claims to set forth the practical limits of operation for the invention and it effectively ignores the scope of enablement provided by the specification as a whole."

See also *Ex parte Rinehart*, 10 U.S.P.Q.2d 1719 (Bd. Pat. App. & Interfer. 1989):

> "We fail to find any thing in the claims which are outside the scope of that which is described in the specification. Each of claims 7, 9 and 37 and the claims dependent thereon are specific to the process of preparing Didemnin A, B and C having the specified characteristics set out in the claims. The specification describes how to prepare each of the enumerated species; the claims and the disclosure are of clear, definite and determined scope. The specification provides, by way of a written description and examples, clear and adequate direction to enable one to produce the specifically described and claimed subject matter. In essence, the claims are drawn to what is precisely disclosed in and enabled by the specification. . . .
>
> With reference to the examiner's holding that the claims are too broad in failing to set forth all process parameters, we note that the claims set forth the steps in a clear and cogent manner. Thus, the extraction of the marine tunicate with methyl alcohol and toluene in a defined ratio, followed by separation and purification of the extract with silica gel chromatography in step gradient fashion by eluting the column with a specific solvent system is a well known technique. We perceive of no reason to require process limitations which would be obvious to and are within the ordinary skill of the worker in the relevant art."

See also, *In re Skrivan*, 166 U.S.P.Q. 85 (CCPA 1970)("We see no more reason for requiring that appellant recite the specific angles at which the reactants in his process are to be combined than we do for requiring the recitation of flow rates or size of reactor or any other physical operating condition which might be required in order to obtain an operable process. Those limitations deal with

factors which must be presumed to be within the level of ordinary skill in the art. We hold that claims need not recite such factors where one of ordinary skill in the art, to whom the specification and claims are directed, would consider them obvious.").

Applicants respectfully submit that one skilled in the art, upon reading applicants claims, will then resort to the specification and find appropriate guidance as to what specific means are employed to determine the degree of annular flow. As the foregoing demonstrates, applicants are **not** required to recite such limitations in the claims. To that end, regarding step b, the specification teaches at page 8, line 36 to page 9, line 3, page 9, lines 9-15, page 10, lines 15-23 and lines 31-36, page 11, lines 1-3 and lines 19-22, and page 18, lines 26 to page 19, line 4 that the degree of annular flow is calculated based on an empirical derived mathematical model relating the frequency of the electromagnetic phase measurements or the value of the electromagnetic loss measurements to an empirical derived value for the degree of annular flow. It is obvious for a person skilled in the art of mathematical modeling that several types of mathematical models can be used for this purpose. As indicated in the specification, one mathematical modeling approach which is particularly suited

for prediction of the behavior of experimental data is neural networks.

Regarding step c, the specification teaches at page 8, lines 34-36, page 10, liens 15-18, and in equations 6 and 9, that the permittivity of the mixture is calculated based on the frequency at a measured predetermined phase difference which is divided by empirically determined calibration constant(s). In addition, as taught on page 8, line 34-36 and page 9 line 1-3, page 9, line 7-15,page 10, line 15-23, 31-36 and page 11, line 1-3, page 11, line 19-22 and page 18, line 19-35, the degree of annular flow is not being corrected, however the measured permittivity of the flow is corrected related to the degree of annular flow. One way of correcting the permittivity related to the degree of annular flow is to use an empirical derived mathematical model which relates the theoretical homogenous permittivity for the mixture to the measured permittivity and the degree of annular flow. By homogenous permittivity means the corresponding permittivity which had been measured if the mixture was evenly distributed in the cross section of the pipe. It is obvious for a person skilled in the art how the permittivity of a homogenous mixture of a known oil, water and gas fraction can be calculated.

The homogeneous permittivity can also be achieved by using a first model to calculate the degree of annular flow based on the measured electromagnetic loss and measured frequency of the measured electromagnetic phase, and a second model to calculate compensation to the permittivity measurement based on the degree of annular flow. The compensation may be in the form of a multiplication factor or a direct calculation of the final compensated result. The model can be developed based on empirical data and it is obvious for a person skilled in the art of mathematical modeling that several types of mathematical models can be used for this purpose. One mathematical modeling approach which is particularly suited for prediction of the behavior of experimental data is neural networks.

The corrected homogenous permittivity can also be obtained by using an empirical derived mathematical model which relates permittivity measurements which are sensitive to different parts of the cross section of the pipe to the homogenous permittivity for the cross section in combination with the degree of annular flow.

To summarize, the model for calculation the degree of annular flow and the model for calculating the compensation may either be based on permittivity measurements or obtained directly from the frequency of the electromagnetic

phase measurements or the electromagnetic loss measurements.

The Examiner states that in claim 1, step c, "the flow mixture" lacks clear antecedent basis. By the accompanying amendment, the term has been amended to be consistent with the preamble of the claim.

The Examiner states that step d of claim 1 does not particularly point out how exactly the mixture density is being compensated. The specification teaches at page 12, line 1-5 and page 20, line 5-10 that the density of the mixture can be compensated for the degree of annular flow in the same manner as the permittivity. That is, an empirical model can be derived which relates the measured density and the degree of annular flow to the corresponding homogenous density of the cross section. Homogenous density means the corresponding density which would have been measured if the liquid and gas were evenly distributed in the cross section of the pipe. The model can be developed based on empirical data and it is obvious for a person skilled in the art of mathematical modeling that several types of mathematical models can be used for this purpose. One mathematical modeling approach which is particularly suited for prediction of the behavior of experimental data is neural networks. Another way of obtaining the

homogenous density is to derive a compensation model based on a geometrical description of the cover area for the density measurement in the cross section of the pipe. It is obvious for a person skilled in the art how this can be achieved, and it need not be recited in the claim.

The Examiner states that in step e of claim 1 and in step f of claim 12, it is not clear to what the temperature and pressure refers. The temperature and pressure are of the multiphase mixture. The claims have been amended accordingly.

The Examiner questions whether step f of claim 1 and step e of claim 12 are referring to the velocity of the gas and at least one liquid in the pipe. The velocity is referring to the velocity of the gas and the liquid phase, i.e., it is assumed that all of the liquids travel at the same velocity. This is a common assumption for multiphase metering of oil, water and gas and is obvious to a person skilled in the art.

The Examiner states that step g of claims 1 and 12 recite "based on the knowledge of densities and permittivities of the components of the fluid mixture, and the result from the above steps a-f, the volume and mass flow rates of the gas and liquids or liquids of the fluid mixture are calculated", which does not particularly point

out exactly how the densities, permittivities and the results of steps a-f are being used to calculate the volume and mass flow rates of the gas and liquid or liquids of the fluid mixture. The method for calculating the flow rates from the steps a-f is outlined in page 14-21 of the PCT patent application. It is also obvious to a person skilled in the art how the component fractions of a three component multiphase mixture can be obtained based on the density and permittivity of the mixture and the corresponding density and permittivity of the components of the multiphase mixture. Methods for measuring the component velocities for liquid and gas of a corresponding multiphase mixture is also obvious to a person skilled in the art. As set forth above, applicants are not required to recite such methods in the claims.

The Examiner states that "the multiphase flow" lacks antecedent basis in claim 2. By the accompanying amendment, claim 2 has been amended to recite "flow mixture".

The Examiner questions what the electromagnetic measurements in claim 4 are referring to. The electromagnetic measurements referred to in claim 4 are the electromagnetic phase measurements. Claim 4 has been amended accordingly.

Claim 7 has been amended to provide proper antecedent basis for the receiving antennas, and claims 10 and 20 have been amended to provide proper antecedent basis for the venturi outlet.

The Examiner states that part b of claim 12 recites a suitable data model, but that this is vague with respect to what type of data model is suitable for determination of the degree of annular flow. It is well known to those skilled in the art of mathematical modeling that an empirical determined data model is a typical model, and that several types of mathematical models can be used for this purpose. As disclosed, one mathematical modeling approach which is particularly suited for prediction of the behavior of experimental data is neural networks.

The Examiner states that part c of claim 12 recites "a computer and a mathematical program for calculating the permittivity of the flow mixture", but that since the program is not being stored such as on a computer readable storage medium, there is ambiguity with respect to how the functionality of such a program is being realized as well as vagueness with respect to what type(s) of programs are being referred to here specifically for performing the described calculation. By the accompanying amendment, claim

12 has been amended to recite that the computer has a storage element comprising the mathematical program.

Part d of claim 12 has been amended to recite that it is the mixture density that is being compensated for the degree of annular flow.

Claim 14 has been amended to recite that the frequency sweep is transmitted on one transmitting antenna at a time.

Claim 15 has been amended to recite that the loss is electromagnetic loss.

Reconsideration and allowance are respectfully requested in view of the foregoing.

Respectfully submitted,

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Amendments to the Drawings

The attached sheets of drawings include changes to Figures 1-17, and replace the original sheets including Figures 1-17. In Figures 1-17, the PCT information has been removed. In Figures 1, 6 and 7, the multiple view have been labeled separately. In Figure 1, the black markings have been removed.